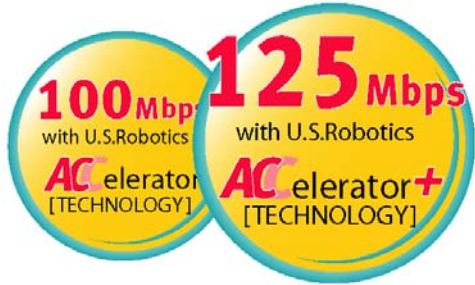


U.S. Robotics®

802.11g Speed Acceleration How We Do It



Background

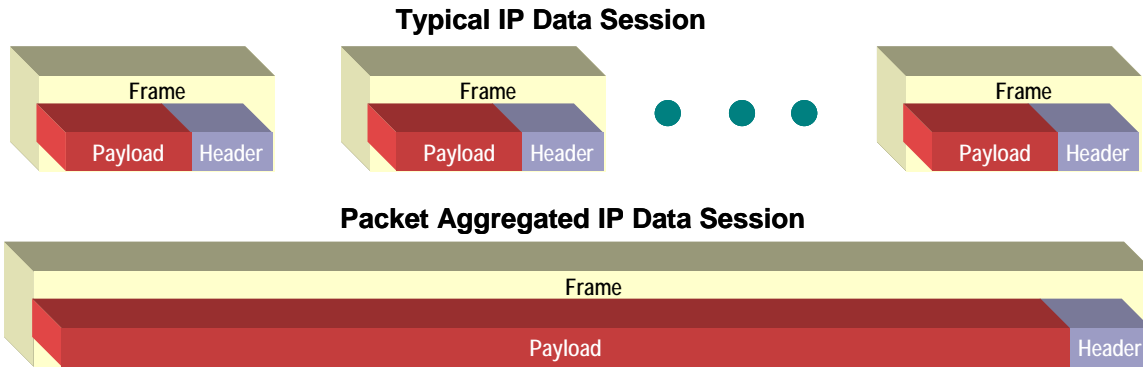
In the summer of 2003, the 802.11g standard for high-speed wireless products was finalized and products that met this standard transmitted data at 54 Mbps. Adherence to the standard assured that products from various vendors could communicate with each other in a seamless fashion.

Soon thereafter, technological advances began to deliver even faster speeds and throughputs. U.S. Robotics launched the "Turbo" family of 802.11g+ products capable of 100 Mbps performance - a significant speed improvement over the standard - while maintaining compatibility with standards based products. Recently U.S. Robotics announced an additional speed boost for its "Turbo" wireless product line, to 125Mbps - more than doubling the speed of standard 802.11g products. This white paper provides a high level explanation of how these performance gains are accomplished.

Achieving 100 Mbps Performance – Packet Aggregation

U.S. Robotics performance improvements are accomplished using a procedure called "packet aggregation." As with our previous 802.11b 22 Mbps product offerings, 100 Mbps performance is completely compatible with all 802.11g and 802.11b standards-based devices.

Packet aggregation involves combining smaller data packets into larger ones. Traditional IEEE 802.11 implementations use a maximum packet length of up to 1500 bytes, standard for Ethernet LANs. The U.S. Robotics physical layer is designed to create data packets that are up to 4000 bytes long. *These longer packets help reduce protocol overhead and thereby increase effective throughput as illustrated below.*



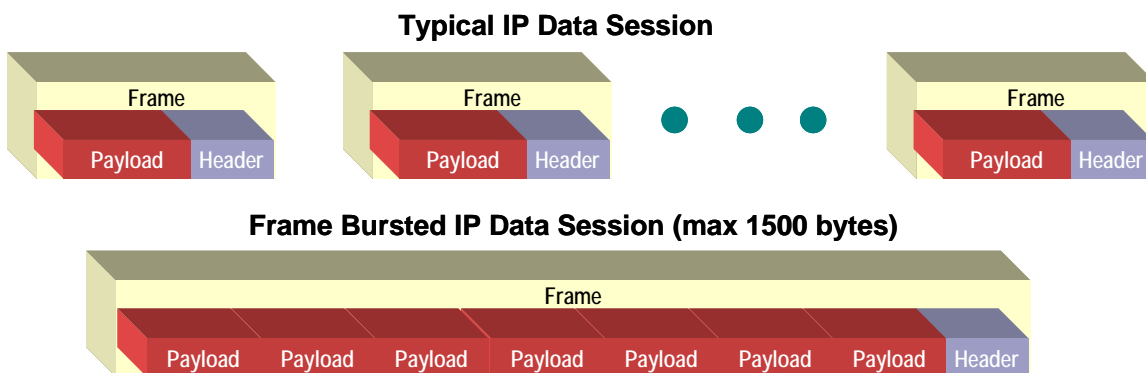
This technique accomplishes two important efficiencies – it reduces the buffer space needed between each frame (composed of the payload and the header) and it reduces the header overhead. This results in:

- Overall throughput improvement for speeds up to 25-30 Mbps versus the 15-20 Mbps average among other 802.11g products
- Complete compatibility with devices based on 802.11b, 802.11b+ (22 Mbps) or 802.11g standard, from U.S. Robotics or any other vendor

Achieving 125 Mbps Performance - Framebursting

The second speed improvement that will be released soon is related to the Wireless Media Enhancements (WME) specification, commonly referred to as framebursting or packet bursting.

Framebursting is a modification to the inter-frame spacing of 802.11 packets. Essentially the space between data frames is reduced in order to “burst,” or rapidly send, packets back to back in a shorter timeframe. This technique allows the higher data rates of 802.11g to be used to their full capacity to transmit for the same amount of time as the slower data rates in 802.11b. The diagram below is a graphical representation of framebursting.



Framebursting is a technological improvement that has been introduced in various products to provide enhanced speed, typically resulting in performance improvement of up to 25%.

For the U.S. Robotics 802.11g Wireless Turbo family of products, the addition of framebursting delivers that 25% speed boost on top of the already accelerated 100Mbps performance, achieving speeds up to 125Mbps. The following products take advantage of this additional performance acceleration:

- U.S. Robotics 802.11g Wireless Turbo Router (model USR5450)
- U.S. Robotics 802.11g Wireless Turbo Multi-Function Access Point (model USR8054)
- U.S. Robotics 802.11g Wireless Turbo PC Card (model USR5410)
- U.S. Robotics 802.11g Wireless Turbo PCI Card (model USR5416)

This speed improvement applies to all current Turbo products and will be available via free software/firmware downloads for existing customers in June 2004.

Summary

U.S. Robotics continues to set the pace for speed enhancements in 802.11g wireless solutions. And, perhaps more importantly, we are taking care to enhance the capability of products that our customers purchase by providing upgrade paths so they can take advantage of the latest technology innovations. By implementing U.S. Robotics 802.11g Wireless Turbo solutions customers get products that deliver leading performance, excellent compatibility (with 802.11b 11 Mbps, 802.11b+ 22 Mbps, 802.11g 54 Mbps, 802.11g+ 100 Mbps and now 802.11g++ 125 Mbps), powerful security (with 256-bit WEP encryption), broader range and obsolescence protection.

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